WBS 1.10 Installation

(& Commissioning)

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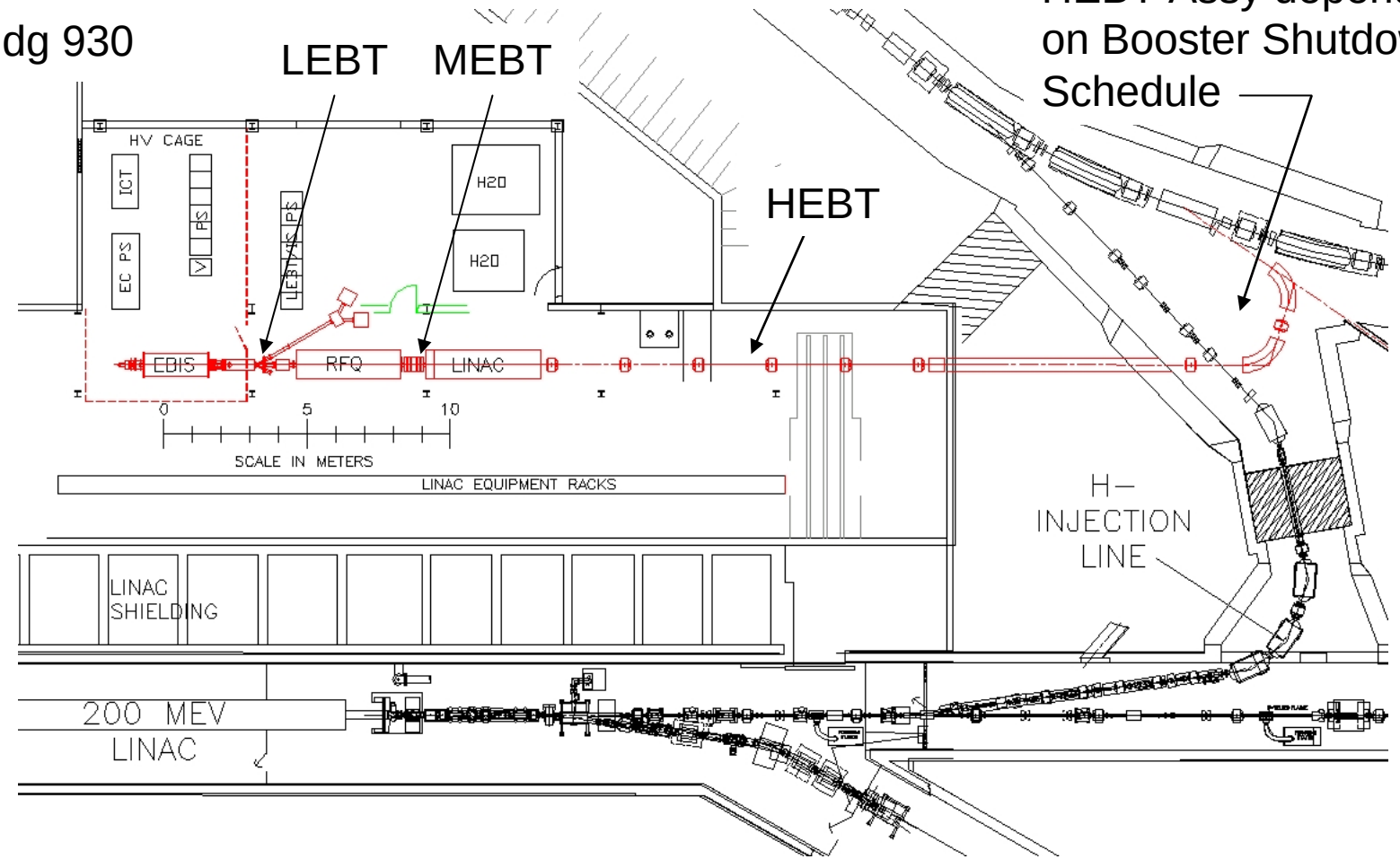
WBS 1.10 Installation

The scope of the installation effort for the individual subsystems is contained in the following WBS sections:

1.10.1 Structural Components
1.10.2 Control Systems
1.10.3 Diagnostics
1.10.4 Magnet Systems
1.10.5 Power Supply Systems
1.10.6 RF Power Supplies
1.10.7 Vacuum Systems
1.10.8 Cooling Systems

WBS 1.10 Installation

EBIS Site
Bldg 930



WBS 1.10 Installation

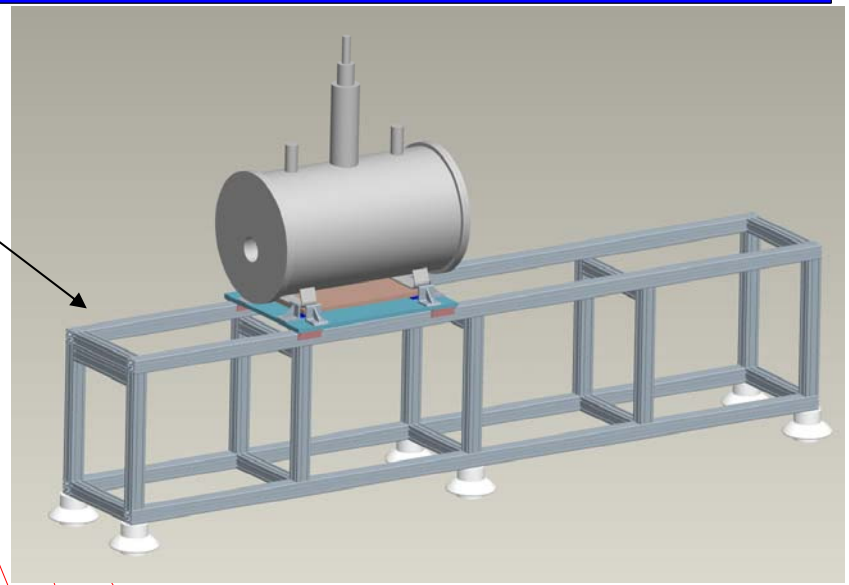
- The Installation effort is based upon the following pre-existing conditions:
  - Power available from installed distribution panels and disconnect switches.
  - For power and electronic systems (e.g., controls, diagnostics, power supplies, and vacuum):
    - Electronic racks are in place (WBS 1.9).
    - Power cable to the electronic racks (WBS 1.9).
    - Cable tray is installed (WBS 1.9).
  - Electron Beam Ion Source pre-assembled and partially tested in building 930 HV Testing Area prior to installation.
  - LEBT pre-assembled prior installation effort, then partially disassembled, moved, reassembled and aligned at the facility site.

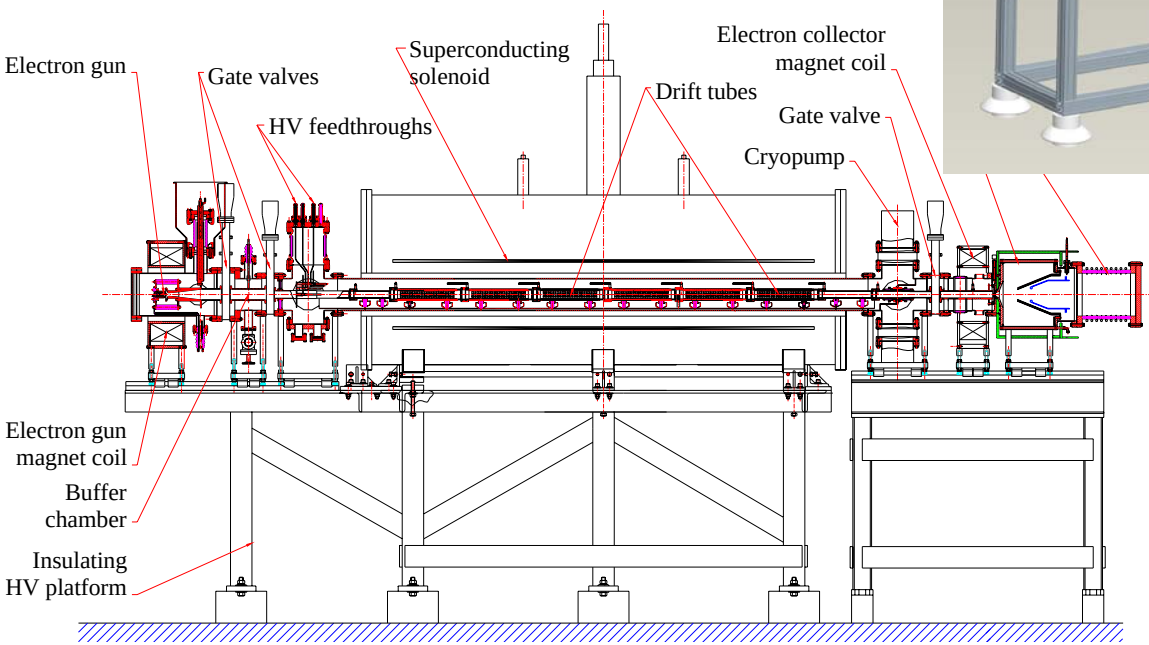
WBS 1.10 Installation

ELECTRON BEAM ION SOURCE

Pre-assembled EBIS on HV Platform to be transported to site. Some disassembly may be req'd.

HV Platform (Conceptual) for Test Stand





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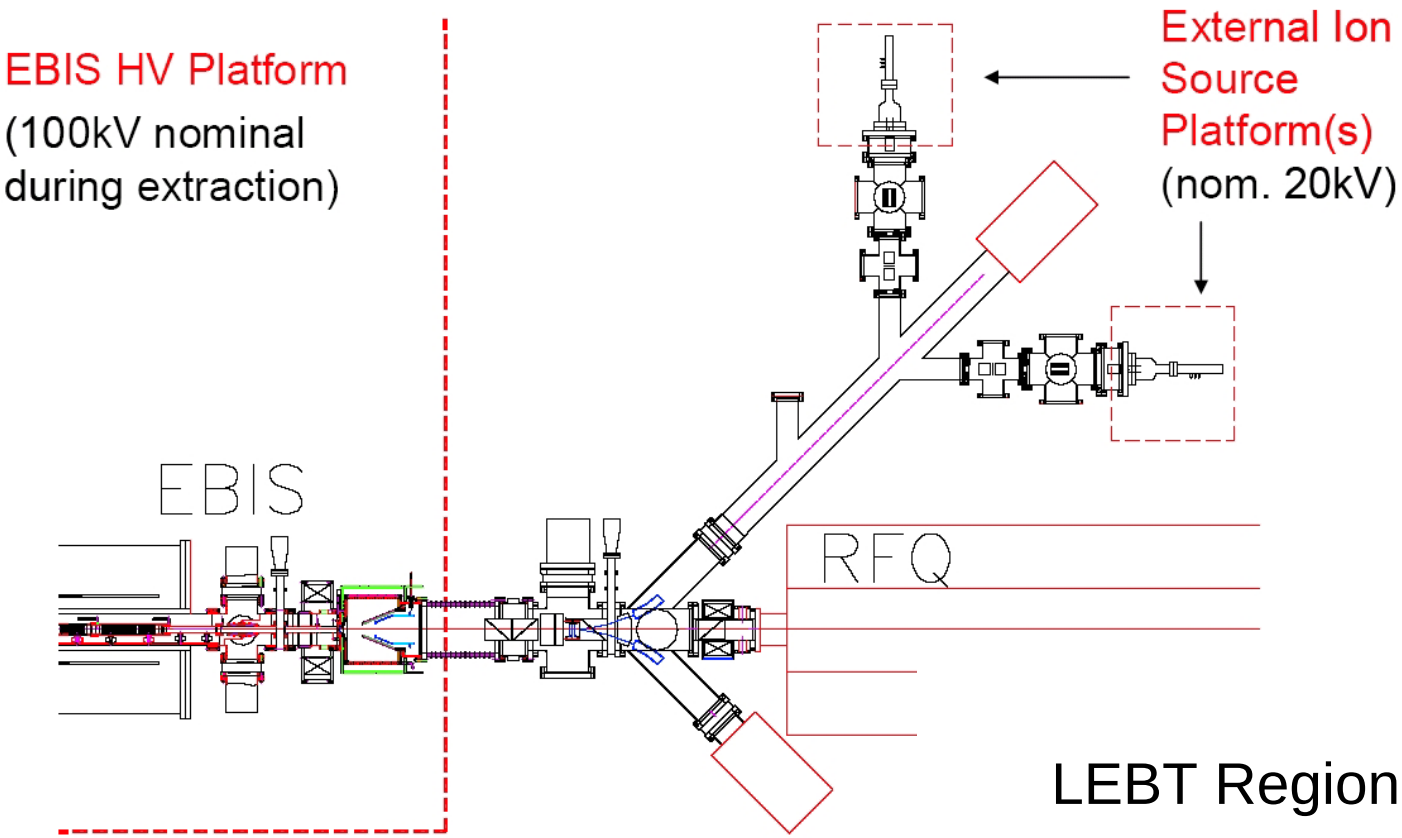
WBS 1.10 Installation



Partial disassemble, transport, re-assemble, align

WBS 1.10 Installation

- **Scope of Work for WBS 1.10.1 Structural Components**
  - Pre-survey of facility site and major components.
  - Installation of anchor bolts for major components and stands and base grouting.
  - Transport of EBIS to the facility site from pre-assembly area.
  - Transport of LEBT components and external ion sources to facility site from pre-assembly area.
  - Linac and RFQ installation.
  - MEBT installation, including stand, quadrupoles (4), buncher, and diagnostic devices.
  - HEBT installation, including stands, debunchers (2), diagnostic devices, and survey and alignment of beam line.
  - HV enclosure.

WBS 1.10 Installation

- **Scope of Work for WBS 1.10.2, Control Systems**:
  - Install controls for Timing & Infrastructure, EBIS, and Accelerator & Beam Transport, including:
    - Chassis/cables
    - Integrate/test software
    - Integrate/test hardware

- **Scope of Work for WBS 1.10.3, Diagnostics**:
  - Install Faraday cups, beam profile monitors, and current transformers, including:
    - Chassis/cables
    - Integrate/test electronics
    - Integrate/test control interface

WBS 1.10 Installation

- **Scope of Work for WBS 1.10.4, Magnets**:
  - Installation of HEBT dipoles (2) and quadrupoles (8), including rigging/transport of magnets into HEBT line, anchor bolts, and grouting.

- **Scope of Work for WBS 1.10.5, Power Supplies**:
  - Install PS's and ICT's for all magnets, diagnostic and electrostatic devices, including:
    - Receipt inspection.
    - Cabling/lugs
    - Testing and As-built documentation
    - Power cables from distribution panels or main disconnects to power supplies/power supply racks
  - Material Cost for Cables

WBS 1.10 Installation

- **Scope of Work for WBS 1.10.6, RF Power Supplies**:
  - Installation of RFQ and Linac power supplies at EBIS site.
  - Fabrication of circulator support structure.

- **Scope of Work for WBS 1.10.7, Vacuum Systems**:
  - Install beam pipe sections, vacuum chambers, and beam line support stands.
  - Install vacuum valves and pumps.
  - Install power, instrumentation, and control cables.
  - Install instrumentation and control system.
  - Perform test and checkout of instrument system and vacuum components.
  - Bake out beam line, chambers, and beam components.

WBS 1.10 Installation

- **Scope of Work for WBS 1.10.8, Cooling Systems**:
  - Assembly labor for closed loop cooling water systems:
    - Sys 1: EBIS Electron collector and Linac quadrupoles.
    - Sys 2: EBIS HV platform components, RFQ and Linac power supplies, and RFQ and Linac circulators.
    - Sys 3: RFQ and Linac.
  - Labor and materials to extend the existing Booster cooling water system to HEBT dipoles.
  - Labor and materials to increase piping size and extend the existing Linac chilled water system.
  - Labor and materials to disconnect and reconnect water cooling lines to existing equipment that must be relocated.
  - PLC instrumentation and control system assembly, installation, test and checkout, including cables installation.

WBS 1.10 Installation

- Major procurements (’05$):
  - Most of the procurements will be made in WBS’s 1.1 through 1.9, with the following exceptions:
    - WBS 1.10.1: High Voltage Enclosure - $13,000
    - WBS 1.10.3: Electrical Racks/PS’s - $16,300
    - WBS 1.10.5: Cable - $88,490
    - WBS 1.10.8: Piping Materials - $14,000

Schedule

- Installation begins in Q1, FY'08, and is done in stages over ~15 months.
- Procurements will be scheduled so the installation work in the Booster tunnel is done during the FY'08 summer shutdown period.

WBS 1.10 Installation

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- **Estimated Cost**

WBS	Description	Direct FY'05K$			
		Mat'l	Labor	Contingency	Total
1.10	Installation	145	940	$230 (21%)	1315

- **Labor hours/equivalents**

Resource Category	estimated hours
Scientist	125
Engineer	1,975
Designer	875
Management	75
Technician Supervision	275
Technician	7,450
Building Trades	4,200
Total	14,975
Full Time Equivalents	8.5

Commissioning

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- Present estimate for effort is ~1.5 FTEs
- Cost ~ 300 k$ (burdened, AY$)
- Commissioning is presently included within the various WBS elements, but will be pulled out explicitly for CD2.